REMARKS/ARGUMENTS

Claims 1, 4-13 and 20-67 remain in the application, of which claims 20-30 and 38-61 have been withdrawn from consideration. Reconsideration of the claims is respectfully requested.

The undersigned would like to thank Examiner Chambers for the courtesy of the telephone interview that was conducted in this matter on December 4, 2003. During that interview, the distinctions between the claims and the Darby, Adams and Julian patents were discussed. The undersigned further indicated that Applicants would be filing a supplement to the November 5 Response.

Paragraph 3 of the Office Action rejects claims 35-37 under 35 U.S.C. § 112, ¶ 1, as failing to comply with the enablement requirement. This rejection is respectfully traversed. Regarding claim 35, the Office Action states:

> [C]laim 35 requires capacitors that charge in approximately five milliseconds or less. However, the charging time of a capacitor is a function of not only the capacitance of the capacitor but other factors including power supply peak power rating, load charge in volts and power supply rating. Applicant does not disclose other factors so that the claimed charging time of the specification is not enabled by the specification.

Claim 35 as amended is directed to "a networked electronic ordnance system . . . wherein the amperage of the charging current and capacitance of the energy reserve capacitors are selected such that the capacitors are charged in approximately five milliseconds or less." Electrical engineering is not an unpredictable art like chemistry or biotechnology. It is respectfully submitted that one of ordinary skill in the art of electrical engineering would know that other factors affect the charging time of the energy reserve

capacitors and would be able to construct the device claimed in claims 35 and 37 without undue experimentation. Hence, it is respectfully submitted that claims 35 and 37 meet the requirements of 35 U.S.C. §112, ¶ 1.

Paragraph 4 of the Office Action rejects claim 37 under 35 U.S.C. § 112, ¶ 2, as being indefinite. In particular, the Examiner contends that the phrase "on the order of" 2 microfarads is indefinite. Using such terms of degree does not automatically render a claim indefinite under 35 U.S.C. § 112, ¶ 2. *Seattle Box co. v. Industrial Crating & Packing, Inc.*, 731 F.2d 818 (Fed. Cir. 1984). The acceptability of such language depends on whether one of ordinary skill in the art would understand what is claimed, in light of the specification. *Id.* In the present instance, when the limitation in question is read in combination with independent claim 35, it is clear that what is required is a capacitance of about 2 microfarads in order to achieve a charging time of five milliseconds or less. When read in this context, it is respectfully submitted that one of skill in the art would understand the scope of claim 37.

Paragraphs 6-14 of the Office Action reject claims 1, 4-12 and 31-37 under 35 U.S.C. 102(b) and (e) as anticipated by U.S. Patent No. 6,166,452 to Adams et al. and U.S. Patent No. 5,825,098 to Darby. This rejection is respectfully traversed.

In connection with claims 1, 10, 31, 32, and 34, the Office Action, states that Darby "discloses an ECU that can communicate with the igniters of Adams using a single command that can be used to address as few as one and as many as all of the (*sic*) igniters of Adams." (See Office Action at ¶ 7). In support of this contention, the Office Action cites to the following sections of Darby:

The present invention is directed to a vehicle safety system with safety device controllers, to a method of controlling a vehicle safety system with safety device controllers, to a safety device controller, and to a method for controlling the activation of a vehicle safety device in a vehicle safety system. The system provides protection and prevents injury to vehicle occupants in the event of a vehicle crash, collision, or impact. The vehicle safety system is comprised of a central electronic control unit that communicates with safety device controllers over a bi-directional communication bus. The safety device controllers are associated with and may be located in close proximity to vehicle safety devices such as airbags, seatbelt tensioners, fuel cutoff switches, etc. (Darby col. 2, ll. 24-37 (underlined to show col. 2, ll. 28-36 as relied on in office action)).

* * *

A system having features of the present invention is a vehicle safety system with safety device controllers comprising a plurality of safety device controllers, each safety device controller controlling activation of a vehicle safety device. Each safety device controller communicates with an electronic control unit over a communication bus. The electronic control unit includes a control means for interchanging data with a communication means, with an external data interface means, with a diagnostic port interface means, with an acceleration sensor device, and with a memory means, and for performing control algorithms. (Darby, col. 3, ll. 19-29 (underlined to show col. 3, ll. 20-25 as relied on in office action)).

* * *

The safety device activation commands and the integrity data commands are comprised of a binary coded address part for selecting a particular safety device controller 200, and a binary coded command part that specifies the action to be performed by the selected safety device controller 200. The ECU external data interface 330 is connected to the ECU control circuit 310 for control and data interchange. (Darby, col. 10, ll. 60-67 (underlined to show col. 10, ll. 60-65 as relied on in office action)).

* * *

The safety device controller (SDC) 200 also comprises the SDC communication interface 220 for receiving safety device activation commands and integrity data commands from the communication bus

> 500, which are forwarded to the SDC control circuit. These commands typically comprise a binary coded address part that selects a particular safety device controller 200, and a binary coded command part that determines the action to be taken. The SDC communication interface 220 also manages communication bus protocol, and sends safety device controller integrity data and fault warning messages onto the communication bus 500 from the SDC control circuit 210 in response to an integrity data command. (Darby, col. 13, ll. 44-56 (underlined to show col. 13, ll. 48-55 as relied on in office action)).

After careful review of the identified sections of Darby (and the remaining text of Darby), Applicants can discern no support for the contention that Darby "discloses an ECU that can communicate with the igniters of Adams using a single command that can be used to address as few as one and as many as all of the igniters of Adams." To the contrary, the cited sections of Darby disclose using unique commands for each device. (*See, e.g.*, Darby, col. 13, ll. 49-50 "commands typically comprise a binary coded address part that selects a particular safety device controller . . . ."; col. 10, ll. 61-63 "commands are comprised of a binary coded address part for selecting a particular safety device controller 200 . . . ."). In this respect, Darby is consistent with Adams, which also relies on an addressing scheme that uses a "unique" command for each device. (See, Adams, col. 5, ll. 33-44).

Neither Darby nor Adams disclose or suggest an addressing scheme where "a single command can be used to address as few as one and as many as all of the pyrotechnic devices that are connected to the network," as recited in claim 1. According to the Office Action, "the Darby specification makes it very clear that the ECU can address any an (*sic*) all of the igniters." While this statement may be true, Darby requires separate commands for each device that is being addressed. By contrast, in

the system of claim 1 a single command can be used to address as few as one and as many as all of the devices (or any combination therebetween). The system of claim 1 provides complete flexibility in testing, loading, disarming and/or firing any combination of the pyrotechnic devices that are connected to the network. This feature simply is not disclosed or contemplated in Darby or Adams. Hence, claim 1 (and its dependent claims 4-13, 31 and 32) are patentable over Adams and Darby.

Claim 4 depends from claim 1 and further recites that the "bus controller transmits and receives multiplexed digital signals over said network." The Office Action apparently equates the electronic control unit (ECU) of Adams to the claimed bus controller. The Office Action cites to column 5, lines 29-32 of Adams in connection with the multiplexing feature recited in claim 4. This portion of Adams states that "[t]he diagnostic means comprises, for example, a multiplexer an analog-to-digital convert r for reading the safety device controller integrity data and <u>sending</u> the controller integrity <u>data to the ECU (Emphasis Added)</u>." This does not constitute a disclosure of a bus controller that <u>transmits</u> and receives multiplexed digital signals over a network, as recited in claim 4. At most, the ECU of Adams may receive multiplexed signals. Hence, this is an additional patentable distinction between claim 4 and Adams.

Claims 6 and 9 ultimately depend from claim 1 and further recite "a bleed resistor electrically connected to said energy reserve capacitor [of a respective pyrotechnic device]." As discussed on page 18 of the present application, a pyrotechnic device can be "disarmed" by discharging its energy reserve capacitor into the bleed resistor. The Office Action indicates that Adams discloses bleed resistors at column 4, lines 10-18.

However, the resistors described at the cited text do not constitute bleed resistors within the meaning of claims 6 and 9. Rather, the cited text discusses using resistors 63, 64 to "provide buffer resistance and suppress electromagnetic interference." The text also discusses using a resistor 60 which "sets up a diagnostic current for a controller 59. . . ." None of these resistors constitute bleed resisters within the meaning of claims 6 and 9. The resistors 60, 63 and 64 in Adams also do not appear to be "electrically connected to said energy reserve capacitor" as specified in claims 6 and 9. Hence, the claimed bleed resistor of Claims 6 and 9 is another patentable distinction over Adams.

Claims 31 and 32 ultimately depend from claim 1 and are patentable over Adams and Darby for the reasons given above. Moreover, these claims recite further patentable distinctions over Adams and Darby. Specifically, claim 31 specifies that the bus controller automatically assigns the unique identifiers to each logic device. Claim 32 further specifies that the bus controller assigns the unique identifies to the logic devices each time the ordnance system is powered up. As is acknowledged in the Office Action, see paragraph 20, these claimed features are not disclosed in Adams and Darby. Further, as explained below, these claim features are not met by the Julian patent, which is discussed in paragraph 20 of the Office Action in connection with claims 62 and 63. Hence, claims 31 and 32 are patentable over the cited references.

Claims 33 and 34 recite "means for altering an analog condition <u>of the network</u> to a firing condition . . . storing activation energy in the associated pyrotechnic device if the digital arming command includes the unique identifier of the logic device; and releasing the stored activation energy into the initiator of its associated pyrotechnic device if both

(1) the analog condition of the network has been modified to the firing condition and (2) the digital firing command includes the unique identifier of the logic device." Thus, before a given pyrotechnic device can be fired, it is necessary to both (1) modify an analog network condition and (2) issue a firing command that includes the unique identifier for the logic device of that specific pyrotechnic device. As is discussed in the specification, this claimed feature enhances safety by reducing the possibility of erroneously firing a pyrotechnic device. This claimed combination is not disclosed nor suggested in the cited references.

The Office Action states "the analog condition to firing condition subject matter of applicant's claim 33 is anticipated by the analog to digital converter disclosed in Darby. (See, Darby, col. 8, ll. 12-15; col. 14, ll. 3-40). However, neither the cited text nor any other portion of Darby disclose or suggest "altering an analog condition of the network to a firing condition" and "releasing the stored activation energy into the initiator of its associated pyrotechnic device if both (1) the analog condition of the network has been modified to the firing condition and (2) the digital firing command includes the unique identifier of the logic device." Rather, Darby discloses only activating a given safety controller device (SDC) when integrity tests indicate that particular SDC has not malfunctioned.

> The safety device controller (SDC) 200 of FIG. 4 also comprises the SDC control circuit 210 which is a microprocessor in the preferred embodiment, for controlling the SDC communication interface 220, the SDC diagnostic circuit 250 and the SDC safety device controller 230. The SDC control circuit 210 generates an SDC safety device activation signal 280 which is sent to the SDC safety device activation circuit 230 in response to a safety device activation command from the SDC communication interface 220

> and safety device controller integrity data from an SDC diagnostic circuit 250 that does not indicate a malfunction. (Darby, col. 14, ll. 3-13, emphasis added).

The SDC diagnostic circuit 250 of Darby forms part of a respective SDC 200 and is operative for reading integrity data from various components on the SDC 200.

> The SDC diagnostic circuit 250, which typically comprises a multiplexer and an analog-to-digital converter 252, comprises a means for reading the safety device controller integrity data, which includes integrity data for the SDC safing sensor 270, for the safety device 400, for the SDC energy storage capacitor 240, and for the SDC safety device activation circuit 230, and for reading functionality data of the SDC power converter 260. (Darby, col. 14, ll. 13-20).

The SDC control circuit 210 then compares the data received from the SDC diagnostic circuit 250 with predetermined values to determine if the SDC 200 has malfunctioned.

> Also, when the SDC control circuit 210 receives an integrity data command from the SDC communication interface, it reads the safety device controller integrity data from the SDC diagnostic circuit 250, compares the safety device integrity data with predetermined limit values, and generates fault warning messages if the predetermined limit values are exceeded. (Darby, col. 14, ll. 21-27).

If no malfunctions are detected, the SDC control circuit 210 issues an activation signal 280 to the SDC safety activation circuit 230.

> The SDC control circuit 210 generates an SDC safety device activation signal 280 which is sent to the SDC safety device activation circuit 230 in response to . . . safety device controller integrity data from an SDC diagnostic circuit 250 that does not indicate a malfunction. (Darby, col. 14, ll. 7-13)

Upon receipt of the activation signal 280, the SDC safety device activation circuit 230 couples the capacitor 240 to the safety device 400, provided an SDC safing sensor 270

(in the form of an electromechanical acceleration sensor) is also closed. (Darby, col. 14, lines 30-40).

Hence, Darby does disclose activating a particular SDC 200 when the following three conditions are met: (1) an activation command has been issued to that particular SDC, (2) an integrity test of that particular SDC produces acceptable results, and (3) an electromechanical acceleration sensor (safing sensor 270) has been closed. Darby does not, however, disclose or suggest "altering an analog condition of the network to a firing condition" and "releasing the stored activation energy into the initiator of its associated pyrotechnic device if both (1) the analog condition of the network has been modified to the firing condition and (2) the digital firing command includes the unique identifier of the logic device," as required by claims 33 and 34.

In discussing the rejection of claims 5, 8, 35 and 37 in paragraph 9, the Office Action states that "a charging time of 5 milliseconds or less is inherent in a capacitor with a capacitance of 2.2 microfarads or less." First, it should be noted, that claim 35 does not specify the capacitance of the energy reserve capacitor. Instead, this claim specifies that "the amperage of the charging current and capacitance of the energy reserve capacitors are selected such that the capacitors are charged in approximately five milliseconds or less." Moreover, no evidence has been provided to support the contention that the claimed charging time is inherent. Hence, it is submitted that the Office has not met its burden of making a *prima facia* shown that this claim limitation is inherent. To the contrary, the Office Action states that the charging time of the energy reserve capacitor is dependant on a variety of factors including capacitance, peak

power rating, load charge in volts and power supply rating. Further, none of the cited references disclose or suggest a "networked electronic ordnance system . . . wherein the amperage of the charging current and capacitance of the energy reserve capacitors are selected such that the capacitors are charged in approximately five milliseconds or less." Hence, claims 5, 8, 35 and 37 are patentable over the cited references.

Paragraph 13 of the Office Action states "with respect to claims 33 and 63, refer to Adams, col. 5, ll. 52 to col. 6, ll. 8 (transmitting means, altering means, storing means, assigning means)."[1] When this text of Adams is read in combination with other portions of Darby, see, e.g., col. 5, lines 24-33, it becomes clear that Adams suffers from the same deficiencies as Darby. In particular, Adams discloses an igniter 10 that incorporates a controller 59 that is operative for performing integrity tests and transmitting integrity data back to an ECU. Adams does not, however, disclose or suggest "altering an <u>analog condition of the network</u> to a firing condition" and "releasing the stored activation energy into the initiator of its associated pyrotechnic device if both (1) the <u>analog condition of the network</u> has been modified to the firing condition and (2) the digital firing command includes the unique identifier of the logic device." Accordingly, claims 33 and 34 are patentable over Adams and Darby.

Paragraph 17 of the Office Action rejects claims 64 and 65 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,341,562 issued to Brisighella in

---

[1] The reference to claim 63 in this paragraph of the Office Action appears to be an inadvertent error. Claim 63 depends from claim 62 and specifies "the bus controller is operative for assigning the unique identifies to the logic devices each time the networked electronic ordnance device is powered up."

view of Adams. As was discussed above, Adams fails to disclose or suggest an addressing scheme where "a single command can be used to address as few as one and as many as all of the pyrotechnic devices that are connected to the network," as recited in claims 64 and 65. Hence, claims 64 and 65 are patentable over Adams. Brisighella fails to overcome the deficiencies of Adams. Hence, claims 64 and 65 are patentable over the proposed combination of Adams and Brisighella.

Paragraph 18 of the Office Action rejects claim 13 under 35 U.S.C. 103(a) as being unpatentable over Adams in view of U.S. Patent No. 6,403887 to Kebabjian. Claim 13 depends from claim 1 and is patentable over Adams for the reasons discussed above. Kebabjian fails to address the deficiencies of Adams as it relates to claim 1. In particular, Kebabjian fails to disclose or suggest a networked electronic ordnance system where "a single command can be used to address as few as one and as many as all of the pyrotechnic devices that are connected to the network." Hence, claim 13 is patentable over Adams and Kebabjian.

Paragraph 19 of the Office Action rejects claims 35-37 under 35 U.S.C. 103(a) as being unpatentable over Adams/Darby. In this respect, the Office Action acknowledges that Adams/Darby does not disclose a capacitor that is charged in 5 msec or less. Rather, the Office Action alleges that it would have merely been a matter of obvious design choice to provide the ordnance system of Adams/Darby with a capacitor that is charged in approximately 5 msec or less. This rejection has respectfully transversed. No reference has been provided which explicitly discloses or suggest the subject matter of claims 35-37.

The test for obviousness is what the combined teachings of the references would have suggested to one of ordinary skill in the art. See In re Young, 927 F.2d 588, 591, 18 USPQ2d 1089, 1091 (Fed. Cir. 1991) and In re Keller, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981). No reference has been provided which discloses or suggests selecting the amperage of the charging current and capacitance of the energy reserve capacitors such that the capacitors are charged in approximately five milliseconds or less, as required by claims 35 through 37. As such these claims are patentable over the references of record.

Paragraph 20 of Office Action rejects claims 62 and 63 under 35 USC 103(a) as being unpatentable over Adams/Darby in view of Julian (U.S. 5,014,622). This rejection is respectfully traversed. Claims 62 and 63 recite a "bus controller being operative for assigning the unique identifiers to the logic devices." As is acknowledged in the Offic Action, neither Darby nor Adams disclose the subject matter of claims 62 and 63. Instead, the Office Action relies on Julian for allegedly providing the missing teaching. According to the Office Action, "Julian discloses a blasting system comprising a blaster and blasting caps, the blaster operable to assign the blasting caps a unique identifying address (Julian col. 15, ll. 10-20 and col. 16, ll. 28-38)." However, Julian does not disclose or suggest a networked ordnance system where a bus controller automatically assigns unique identifiers as in claims 62 and 63. Rather, Julian discloses a system in which a person (referred to as the "blaster") manually assigns address codes, which are preferably unique, to blasting caps using a blasting galvanometer 18. The specification

makes it clear that the term "blaster" is used in Julian to refer to a human being, not part of the blasting system.

> Overall system operation will now be described with reference to the manner in which a blaster might potentially operate the blasting system. The blaster first examines the blast site and determines where the blasting caps should be installed, preparing a map showing the expected location of each blasting cap and the delay which is required for each blasting cap. Such matters are within the general knowledge of an expert blaster and will not be described in greater detail. (Julian, col. 14, ll. 24-33).

Moreover, although Julian does allow programming the blasting caps with unique codes, this operation requires human intervention (by the blaster), as opposed to being automatically performed by the bus controller, as recited in the rejected claims. Specifically, Julian discloses a system which allows the blaster, i.e., a person, to manually assign address codes for the blasting caps using the blasting galvanometer 18:

> The blaster can then set a new address for the blasting cap. The object at this stage of operations is to assign an address which will uniquely identify the blasting cap in the blasting circuit. The blasting caps are preferably assigned consecutive addresses as this reduces the time required by the blasting galvanometer 18 at later stages of operation to check whether the blasting caps are operatively coupled to the required blasting circuit. This also simplifies scanning of the blasting circuit for improperly connected blasting caps and expedites the operations of the blasting machine 20, as described more fully below.
>
> To initiate the setting of the blasting cap's address, the blaster depresses the set address key 38. The blasting galvanometer 18 then transmits a READ ADDRESS command to the blasting cap using the universal blasting cap address, awaits a response packet containing the current address and nominal delay of the blasting cap, and stores the returned information in its RAM 56. The blasting galvanometer 18 then displays the CAP OK message indicating that the blasting cap is functioning. (The blasting galvanometer 18 otherwise indicates a blasting cap malfunction.)

> The message is acknowledged by depressing the enter key 50, and the blasting galvanometer 18 then displays the message ADDRESS SET followed by the current address recorded in the blasting cap. The blaster acknowledges the message, and the blasting galvanometer 18 prompts the blaster to enter a new address with the message NEW ADDRESS. The blaster then composes and enters the new address which is loaded into a particular RAM location for temporary storage and which is initially set to a zero value. Alternatively, the blaster can simply depress the increment key 44 which increments the value stored in the memory location and initially set to zero by 1. The blasting galvanometer 18 then transmits a WRITE ADDRESS command containing the new address to the blasting cap. This causes the blasting cap to write the new address into the EEPROM for use in further communications and a response packet is returned which essentially confirms receipt of the WRITE ADDRESS command. The blasting galvanometer 18 then transmits a READ ADDRESS command (using the universal blasting cap address) to the blasting cap to cause return of a data packet containing the address of the blasting cap as currently recorded in its EEPROM. The blasting galvanometer 18 compares the address information returned with the address originally transmitted, and generates the message CAP OK if the address has been properly recorded by the blasting cap and otherwise displays the message CAP ERROR indicating a failure to properly record the newly assigned address.

Julian simply does not disclose a bus controller that automatically assigns unique identifiers, e.g. when the system is powered up, in the manner recited in claims 62 and 63. Hence, even if Julian were combined with Adams/Darby in the manner suggested in the Office Action, the resulting system would fail to anticipated claims 62 and 63. In particular, the resulting combination would require human intervention, e.g., by the blaster, to assign the unique identifiers. Hence, claims 62 and 63 are patentable over Adams/Darby in view of Julian.

New claims 66 and 67 are believed to be patentable over the cited references for the reasons given above in connection with claims 33 and 34. Additionally, these new

claims further distinguish over the cited references by reciting "a bus controller connected to said plurality of pyrotechnic devices through said network, said bus controller being operative to (1) transmit a digital arming command onto the network, the digital arming command using one or more of the unique identifiers (2) alter an analog condition of the network to a firing condition; and (3) transmit a digital firing command onto the network, the digital firing command using one or more of the unique identifiers."

In view of the above, claims 1, 4-13, 31-37 and 62-67 are believed to be in condition for allowance. The Examiner is invited to telephone Applicants' undersigned attorney at (312) 775-8000 if any unresolved matters remain.

Fee Payment and Authorization

Please charge any fees due in connection with this submission to Deposit Account No. 13-0017.

Respectfully submitted,

Date: December 4, 2003

Kirk A. Vander Leest
Reg. No. 34,036
Attorney for Applicant

McAndrews, Held & Malloy, Ltd.
500 West Madison Street, 34th Floor
Chicago, Illinois 60661
Telephone: (312) 775-8000
Facsimile: (312) 775-8100